

METHOD OF CHEMICAL MODIFICATION OF STRUCTURE TOPOGRAPHY

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ABSTRACT OF THE DISCLOSURE

A method is provided for filling high aspect ratio gaps without void formation by using a high density plasma (HDP) deposition process with a sequence of deposition and hydrogen etch steps. The first step uses an etch/dep ratio less than one to quickly fill the gap. The first step is interrupted before the opening to the gap is closed. The second step uses a hydrogen-based plasma to chemically etch the deposited material to widen the gap. The second step is stopped before corners of the elements forming the gaps are exposed. These steps can be repeated until the aspect ratio of the gap is reduced so that void-free gap-fill is possible. The etch/dep ratio and duration of each step can be optimized for high throughput and high aspect ratio gap-fill capacity.